

What is claimed is:

1. An apparatus for printing a medical image on a recording medium, comprising:

a printing section to print either said medical image or a test-pattern for evaluating a quality of said medical image, on said recording medium, based on image data;

a printing-condition setting section to set a printing condition for printing said test-pattern; and

a printing-condition displaying section to display said printing condition set by said printing-condition setting section;

wherein said printing section prints at least one of a sharpness-evaluating pattern and a granularity-evaluating pattern.

2. The apparatus of claim 1, further comprising:

an image data creating section to create a new image data based on said printing condition set by said printing-condition setting section.

3. The apparatus of claim 1, further comprising:

a storing section to store said image data; and

wherein said storing section stores at least one set of image data corresponding to said test-pattern to be printed on said recording medium.

4. The apparatus of claim 1,

wherein a plurality of test-patterns, being substantially the same each other, can be printed on said recording medium.

5. The apparatus of claim 4,

wherein border lines between said plurality of test-patterns are also printed on said recording medium.

6. The apparatus of claim 1,

wherein said printing-condition setting section includes a density-setting section to set a density of said medical image, based on a combination of at least one of factors including: a maximum density  $D_{max}$  of said test-pattern in term of either a transmission density or a reflection density; a minimum density  $D_{min}$  of said test-pattern corresponding to said maximum density  $D_{max}$ ; an average value  $D_{ave}$  of said maximum density  $D_{max}$  and said

minimum density  $D_{min}$ ; and a density difference  $\Delta D$ , where  $\Delta D = D_{max} - D_{min}$ .

7. The apparatus of claim 6, further comprising:

an image data creating section to create a new image data based on said density set by said density-setting section.

8. The apparatus of claim 6,

wherein both said test-pattern and said density set by said density-setting section are printed on said recording medium.

9. The apparatus of claim 6, further comprising:

a storing section to store said image data; and

wherein said storing section stores at least one set of image data corresponding to said test-pattern to be printed on said recording medium.

10. The apparatus of claim 9, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in said storing

section corresponding to densities set by said density-setting section; and

wherein said storing section stores at least two of said image data sets, which are different each other in image-signal values so that test-patterns printed on said recording medium are substantially the same each other except said densities.

11. The apparatus of claim 9, further comprising:

an image data processing section to generate new image data sets corresponding to said densities by processing said image data sets stored in advance in said storing section.

12. The apparatus of claim 1,

wherein said printing-condition setting section includes a pixel-size setting section to set a pixel-size of one pixel included in said image data; and further comprising:

an interpolate-processing section to apply an interpolate-processing for either expansion or a reduction of said medical image to said image data, in response to said pixel-size set by said pixel-size setting section.

13. The apparatus of claim 12, further comprising:

an image data creating section to create a new image data based on said pixel-size set by said pixel-size setting section.

14. The apparatus of claim 12,

wherein said printing-condition setting section includes an interpolate-processing method setting section to set interpolate-processing method for either expanding or a reducing of said medical image.

15. The apparatus of claim 12,

wherein both said test-pattern and interpolate-processing information pertaining to said interpolate-processing applied by said interpolate-processing section are printed on said recording medium, and said interpolate-processing information includes at least one of factors including said pixel-size, an interpolate-processing method and an interpolate-scaling factor.

16. The apparatus of claim 12, further comprising:

a storing section to store said image data; and

wherein said storing section stores at least one set of image data corresponding to said test-pattern to be printed on said recording medium.

17. The apparatus of claim 16, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in said storing section corresponding to pixel-sizes set by said pixel-size setting section; and

wherein said storing section stores at least two of said image data sets, which are different each other in an amount of image data so that test-patterns printed on said recording medium are substantially the same each other except image-sizes of said test-patterns.

18. The apparatus of claim 16, further comprising:

an image data processing section to generate new image data sets corresponding to said pixel-sizes by processing said image data sets stored in advance in said storing section.

19. The apparatus of claim 1, further comprising:

an image-direction setting section to set an image-direction of said medical image printed on said recording medium.

20. The apparatus of claim 19, further comprising:

an image data creating section to create a new image data based on said image-direction set by said image-direction setting section.

21. The apparatus of claim 19,

wherein both said test-pattern and information pertaining to said image-direction, set by said image-direction setting section, are printed on said recording medium.

22. The apparatus of claim 19, further comprising:

a storing section to store said image data; and

wherein said storing section stores at least one set of image data corresponding to said test-pattern to be printed on said recording medium.

23. The apparatus of claim 22, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in said storing section corresponding to image-directions, set by said image-direction setting section; and

wherein said storing section stores at least two of said image data sets, which are different each other in said image-direction so that test-patterns printed on said recording medium are substantially the same each other except image-directions of said test-patterns.

24. The apparatus of claim 22, further comprising:

an image data processing section to generate new image data sets corresponding to image-directions, set by said image-direction setting section, by processing said image data sets stored in advance in said storing section.

25. The apparatus of claim 1, further comprising:

a pattern-number setting section to set a number of test-patterns to be printed on said recording medium.

26. The apparatus of claim 25,

wherein a plurality of test-patterns can be printed on said recording medium.



27. The apparatus of claim 26,

wherein said printing-condition setting section includes a combination setting section to set a combination of test-patterns when said pattern-number setting section sets a number of said test-patterns, and said combination of said test-patterns is one of combinations of different evaluating items, different densities, different pixel-sizes, different interpolate-processing methods, different interpolate-scaling factors and different image-directions.

28. The apparatus of claim 26,

wherein, when said pattern-number setting section sets a number of said plurality of test-patterns, border lines between said plurality of test-patterns are also printed on said recording medium.

29. The apparatus of claim 1,

wherein said sharpness-evaluating pattern has more than four kinds of pattern elements, special frequencies of which are different relative to each other and in each of which 1 to 20 periods of each spatial frequency are aligned.

30. The apparatus of claim 29,

wherein a spatial frequency of a normalized pattern element, being one of said pattern elements and having a lowest spatial frequency among them, is not greater than 0.5 cycle/mm.

31. The apparatus of claim 30,

wherein 5 to 20 periods of each spatial frequency are aligned in each of said pattern elements other than said normalized pattern element.

32. The apparatus of claim 29,

wherein a width of each of said pattern elements in a read-scanning direction is in a range of 10 to 200 mm.

33. The apparatus of claim 1, further comprising:

a storing section to store said image data; and

wherein said storing section stores at least one set of image data corresponding to said sharpness-evaluating pattern to be printed on said recording medium.

34. The apparatus of claim 33,

wherein at least two sets of image data are stored in said storing section so that numbers of pattern elements in sharpness-evaluating patterns, to be printed on said recording medium, are different each other.

35. The apparatus of claim 34, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in said storing section corresponding to said numbers of said pattern elements.

36. The apparatus of claim 34, further comprising:

an image data processing section to generate new image data sets corresponding to said numbers of said pattern elements by processing said image data sets stored in advance in said storing section.

37. The apparatus of claim 33, further comprising:

an image data creating section to create a new image data based on a number of pattern elements in said sharpness-evaluating pattern.

38. The apparatus of claim 30,

wherein said printing-condition setting section includes a spatial frequency setting section to set said spatial frequency of said pattern element.

39. The apparatus of claim 38,

wherein more than two image data sets in respect to sharpness-evaluating patterns, in which at least one of special frequencies of pattern elements is/are different relative to each other, are stored in a storing section.

40. The apparatus of claim 39, further comprising:

an image data selecting section to select any one of said image data sets, which are stored in advance in said storing section corresponding to said special frequencies of said pattern elements.

41. The apparatus of claim 38, further comprising:

an image data processing section to generate new image data sets corresponding to special frequencies of pattern elements by processing said image data sets stored in advance in said storing section.

42. The apparatus of claim 29,

wherein said printing-condition setting section includes a profiling-axis setting section to set a profiling-axis of a pattern element.

43. The apparatus of claim 42,

wherein said profiling-axis setting section sets said profiling-axis at either a density, a lightness or a transmittance.

44. The apparatus of claim 42,

wherein at least two of image data sets, which are different each other in image-signal values so that sharpness-evaluating patterns printed on said recording medium are substantially the same each other except said profiling-axis, are stored in a storing section.

45. The apparatus of claim 42, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in a storing section corresponding to said profiling-axis of said pattern elements.

46. The apparatus of claim 42, further comprising:

an image data processing section to generate new image data sets corresponding to said profiling-axis of said pattern element by processing said image data sets stored in advance in a storing section.

47. The apparatus of claim 42, further comprising:

an image data creating section to create a new image data based on said profiling-axis of said pattern element.

48. The apparatus of claim 29,

wherein said printing-condition setting section includes a waveform setting section to set a waveform of a pattern element at either a rectangular wave, a chopping wave or a sine wave.

49. The apparatus of claim 48, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in a storing section corresponding to said waveform of said pattern element.

50. The apparatus of claim 48, further comprising:

an image data processing section to generate new image data sets corresponding to said waveform of said pattern element by processing said image data sets stored in advance in a storing section.

51. The apparatus of claim 1,

wherein said granularity-evaluating pattern has 3 to 20 uniform density regions, each of which has a uniform density being different from others and includes an area of 5 mm X 5 mm but does not exceed an area of 200 mm X 200 mm.

52. The apparatus of claim 51,

wherein said printing-condition setting section includes a density-region setting section to set a number of said uniform density regions.

53. The apparatus of claim 52, further comprising:

an image data selecting section to select any one of image data sets, which are stored in advance in a storing section corresponding to said number of said uniform density regions set by said density-region setting section.

54. The apparatus of claim 52,

wherein, when design diffusion densities of said uniform density regions are not greater than 1.5, each of lines formed between said uniform density regions has a density being not smaller than 2.0.

55. An apparatus for printing a medical image on a recording medium, comprising:

a storing section to store a plurality of image data sets each of which corresponds to either a structure of a human body-part or a test-pattern including an illustration of said structure;

an image data selecting section to select at least one of said image data sets, corresponding to a kind of an image capturing device coupled to said apparatus; and

a printing section to print said test-pattern on said recording medium, based on one of said image data sets selected by said image data selecting section.

56. An apparatus for printing a medical image on a recording medium, comprising:

a storing section to store a plurality of image data sets each of which corresponds to either a structure of a



human body-part or a test-pattern including an illustration of said structure; and

a printing section to print both said test-pattern and information indicating said test-pattern on said recording medium, based on one of said image data sets corresponding to said test-pattern.

57. A test-pattern employed for an image-recording apparatus,

wherein, with respect to either a transmission density or a reflection density, said test-pattern is set on the basis of a density combination of at least two of factors including: a maximum density  $D_{max}$  of an image-pattern; a minimum density  $D_{min}$  of said image-pattern; an average value  $D_{ave}$  of said maximum density  $D_{max}$  and said minimum density  $D_{min}$ ; and a density difference  $\Delta D$ , where  $\Delta D = D_{max} - D_{min}$ .

58. The apparatus of claim 29,

wherein said apparatus is a ink-jet printer, and said sharpness-evaluating pattern includes three or more pattern elements having a spatial frequency being equal to or more than 2.0 cycle/mm at a normalized portion.